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ABSTRACT

With particular attention to vocational research and development, this study reviewed the literature to obtain information on the factors or influences causing teachers to change practices. Research and development in vocational education was treated as an independent variable in an experimental research design with moderating variables of product characteristics, dissemination efforts, teacher education, work context, and teacher characteristics. The sources of information included a number of reviews of research, research monographs, and expert opinion statements. Very limited empirically derived evidence was found regarding the extent to which vocational research and development has influenced teachers to change practices. Speculation based on informed opinion concluded that: (1) The influence of curriculum development and distribution on teacher practice is relatively insignificant; (2) use of dissemination through institutes, workshops, and conferences is inadequate as an influence on teacher practice; (3) teacher education as a mode of dissemination is of negligible influence; and (4) teacher educators as disseminators of research and development are limited in influencing teachers to change practices. Possible explanations for the low return in terms of actual change of teacher practice are offered pertaining to organizational factors and to systems for analyzing the characteristics of educational innovations. (NJ)

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VOCATIONAL EDUCATION RESEARCH AND DEVELOPMENT AS A FACTOR INFLUENCING TEACHERS TO CHANGE PRACTICES

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I. VOCATIONAL EDUCATION RESEARCH AND DEVELOPMENT AND CHANGING TEACHER PRACTICE:

SUMMARY AND CONCLUSIONS

In an effort to flush out the information germane to determining the factors or influences that cause teachers to change practices with particular attention to vocational education R and D as one of those factors, an experimental research design was used as a conceptual framework. Research and development was treated as an independent variable. Moderating variables identified were product characteristics, dissemination efforts, with teacher education viewed as a specific channel, work context and teacher characteristics. The dependent variable was teacher practice.

Primary concern was given to vocational education R and D, but not, to the exclusion of general education R and D which is applicable in some areas. Close links are evident between vocational education R and D and other R and D efforts in education.

The sources of information included a number of reviews of research, research monographs, and expert opinion statements. Systematic empirical studies of factors causing teachers to change practices were few

in number. Consequently with direct evidence so limited, data from which inferences could be drawn, given specific assumptions, were used extensively. Two computer searches of ERIC, AIM, ARM, and Index of Current Journals in Education using descriptors for the variables identified and listed above produced many of the sources referenced in the paper. Many more were reviewed which did not contribute measurably to this inquiry. None-the-less no claim is made for this having been based on an exhaustive search of available data.

Evidence indicates that vocational education R and D efforts have been rather heavily concentrated in the development of curricula as the means to influence teachers to change practices. Some information regarding the numbers of materials distributed and the amount of sales from curriculum laboratories is available, however this is not examined in terms of the numbers of teachers to whom the materials would have relevance. Lacking are systematic studies of the use made of curriculum materials by persons to whom these are distributed. In addition to distribution, instructional and related materials are available through ERIC, AIM, and ARM. What evidence is there that teachers tap resources available through these sources? The evidence is ambiguous but several studies,

one at the state level, the second involving six states, indicate that 10 per cent or less of teachers reported using these sources. Over 50 per cent of administrators, supervisors, and teacher educators were familiar with the information sources, though slightly lower proportions reported using them. These groups then become significant intermediaries in the dissemination process.

The extent to which the development and distribution of curricula influences teachers to change practices remains largely speculative and impressionistic.

In view of the absence of rigorous evaluations of alternative curricula available for the same course, which might demonstrate some superiority for one over another, and the extent to which teaching practices become routinized almost to the point of being habitual, my speculation is that the influence on teacher practices is relatively insignificant.

Dissemination modes are diverse. Institutes, workshops, conferences, and demonstration centers were reported most frequently. Typically, evaluations of the influence of these activities on teacher practices has not been rigorous. Measures of impact frequently have been administered at the conclusion of the activity without follow-up at a later time. The more rigorous evaluations still rely heavily on self-reported changes and tend to

indicate that there are different outcomes for different participants. Specifically for some, the activity may introduce an innovation, for others it may provide more detailed information essential to movement towards an adoption decision. The findings of several studies suggest that the number of participants who actually try a new practice and/or implement programs will probably not exceed 30 to 40 per cent and may be lower. The proportion is likely to be higher or lower contingent upon the practices being disseminated. The use of dissemination as the sole strategy for achieving complex change and behavioral change is rather generally found to be inadequate.

Teacher education is a specific mode of dissemination and competency development. Vocational education R and D has identified teacher competencies as the initial step in a programmatic effort to develop and validate a vocational teacher education curriculum for pre-service and in-service programs. The details of the effort reported earlier lead to the conclusion that this has been another major thrust to impact, eventually, on changing teacher practice. The development work is still in process and thus it is premature to expect more systematically derived evidence of effectiveness in influencing teachers to change behavior. The potential for its effectiveness, however, is

increased inasmuch as it follows an instructional systems approach which has been found to be effective in changing behavior. General education R and D work on teacher education has made some progress in finding more effective ways to alter teacher behavior. Instructional systems, modeling, and involvement in simulated or actual work situations are some of the processes utilized. The extent to which these processes have been incorporated into existing vocational teacher education is not clearly evident. The informed estimate is, however, not widely. Several reviewers report the preponderance with which teacher education programs are determined by tradition, conventional wisdom, and personal experience. It is generally agreed that this is in part due to the relative recency and limited evidence from research regarding significant relationships between teaching practices and educational outcomes.

In brief, R and D has potential for influencing teachers to change practices via improved pre-service and in-service teacher education curricula and processes.

Another dimension that was explored was the evidence regarding the impact of R and D through teacher educators as disseminators of curricula, instructional processes and research. Teacher educators did report greater familarity with and use of information sources of R and D

products. At best however this hovered around the 50 per cent mark. Assuming that teacher educators disseminate information about R and D products, what is the liklihood that knowledge about a practice leads a teacher to implement the practice. Once again the evidence is very limited, and that limited evidence is not too encouraging. One study found that although about 2/3 of 394 T & I teachers reported using behavioral objectives, 39 per cent actually had written objectives to show the investigator during an on-site visit. Another study showed a reduction of from 70 per cent to 30 per cent between self-report and categorizing by the researcher, on additional information.

The explanation for the comparatively low return in terms of actual change of teacher practice may be linked to the fact that workshops, conferences, college courses, and so on, in effect treat teachers as individuals outside of the specific conditions of the school in which they practice. Some exceptions to this, obviously, are in-service programs conducted within the school for all staff. No reports of such endeavors surfaced in the search. At present, there is study of organizational factors related to supporting implementation and maintenance of innovations. Although relationships have not been investigated sufficiently yet, a

number of analysts emphasize the need for system coordination and control, evaluation, feedback and close attention to rewards for teachers to change practices that require the acquisition of new competencies. Some efforts to diffuse R and D products have built in temporary support systems.

Evidence to date indicates that the interface of R and D agencies with local schools is fraught with unresolved problems linked to the allocation of authority, responsibility for implementation and resource sources and allocations. There is much to be learned about the requirements for effective collaborative relations between R and D agencies and schools to net significant impact on teacher practices.

A second variable potentially related to the low return in changes in teacher practices is the present inadequacy of analyzing the characteristics of educational innovations for adoption and implementation strategies. There is general agreement that these characteristics are significant in the ease or difficulty of gaining acceptance, being implemented, and routinized. Yet there is no adequate taxonomy of educational innovations to facilitate analysis of the complex interrelationships between substantive, e.g. curriculum, administrative, and instructional, and more processual characteristics such as complexity, relative advantage, and so on. It should be noted also that research evidence of the relative advantage of

most educational innovations is limited. Thus the costs to change often need to be justified on other grounds.

In sum there is very limited systematic empirically derived direct evidence of the extent to which vocational R and D has influenced teachers to change practices. No evidence came to the fore in this inquiry on the very relevant and related questions as to what are current teacher practices; to what extent and in what ways are current practices discrepant with preferred practices. Answers to these questions would facilitate setting some goals for changing practices and developing some means for achieving these changes. Programmatic R and D efforts are underway in curriculum development and teacher education processes that are directed to teacher practices and have considerable potential. In addition to continuing the present efforts, attention to organizational variables within vocational schools and comprehensive schools which support implementation of instructional changes seems warranted. Research and development efforts should attend also to alternative arrangements for interfacing effectively with state and local agencies to provide the support services necessary in early stages of implementation.

II. METHOD

The conceptual framework used to guide a search of the literature germane to vocational education R and D and teacher practices was that of an experimental research design. Cat egories of variables include independent, moderating and antecedent variables, and the dependent variable. The variables identified and included under each category emerged from an a priori analysis concurrent with a review of the literature.

Independent Variables: Teaching traditions, philosophical traditions, research on learning, and research and development efforts were considered as independent variables. The content of this paper emphasizes the research and development variable. Attention is given to the other independent variables only as these increase insight and understanding regarding the impact of R and D on the dependent variable, i.e. teacher practices.

Antecedent and Moderating Variables: R and D product characteristics; attributes of R and D dissemination and implementation efforts; attributes of teacher education, as a specific type of knowledge dissemination; work context, composed of organizational structure and climate in which teacher

practice occurs; teacher characteristics including demographic, professional, social, and psychological constitute the specific antecedent and moderating variables.

Dependent Variable: Teacher practice in the classroom is defined to include both materials and processes and is the dependent variable.

Search Procedures

The search strategies were designed to bring to the fore studies and expert opinion regarding vocational teacher practices and vocational education R and D primarily. Secondarily, studies and expert opinion on teacher practices, irrespective of subject, and R and D were studied. The expansion of the search was justified by certain conditions and tentatively accepted assumptions.

It is evident that relatively few empirical studies have examined the factors which cause or influence teachers of vocational subjects to change their practices. Indeed at the present time there is limited systematically derived evidence regarding related issues such as the current practices of vocational teachers and the educational gains to be expected from changing some specific current practice to some other practice. In view of this condition, the next best source of information is evidence concerning factors which influence teachers to change practices, whether

these be science teachers, social studies teachers or teachers of other subjects. A strong case can be made for applicability in view of the commonalities which exist in any teaching-learning interaction, the professional preparation of teachers, the greater homogeneity in teacher characteristics resulting from the selective sorting which takes place as individuals choose to teach rather than to engage in some other occupations.

In view of some of the unique conditions and variations which occur between vocational teachers and non-vocational teachers in various areas, conclusions from these sources must be viewed as suggestive rather than generalizable. For example, trade and industrial teachers have a typically different career route into teaching than do home economists, vocational agriculture teachers, business and office, secondary science and mathematics teachers. The extent to which these and other differences may alter relationships between selected factors and changing teacher practices is as yet unknown. Logical analysis can be the starting point for selecting those relationships which seem a priori most applicable to vocational teachers.

Definition of Terms

Research and Development is used to refer to a rational sequential process of utilizing basic research findings for subsequent testing of applications through applied research, to the development, field-testing and revision of prototypes for mass production and packaging. (Havelock, 1969, p. 11-6)

Dissemination refers to planned activities to publicize and distribute products of research and development efforts to appropriate target groups.

Teacher Education refers to pre-service and in-service educational programs designed to enable individuals to acquire, maintain, and improve the competencies necessary to function effectively as a teacher.

Work Context is viewed as having two broad components which are organizational structure and climate. Organizational structure is concerned with the framework of relationships and practices that result from the allocation of authority and responsibility. Climate includes the properties of goals, organizational constraints, group relations, and leadership. (Olmstead, 1973, p. xi)

Teacher Practice refers to teacher behavior in the classroom involving choice and use of instructional materials and processes to promote student learning.

III FINDINGS

RESEARCH AND DEVELOPMENT EFFORTS DIRECTED TO TEACHER PRACTICE

Current teacher practice stems from several fundamental sources. These sources have persisted through time, however as substantive changes have occurred, shifts in teacher practices have occurred. Wallen and Travers (1963 p. 448-464) indicate that teaching patterns have been influenced much more by teaching traditions, social learnings in the teachers' backgrounds, philosophical traditions, the teachers' own needs and conditions in the school and community than by research. As recently as the early 60's, these authors emphasize that it was only within the last few years that scientific knowledge had begun to reach a point which might permit the systematic design of teacher practices to maximize student achievement of specific objectives (p. 452). Thus an R and D effort to impact on teacher practice is indeed one factor among other powerful factors.

Implicit to answering the question "What causes vocational education teachers to change their classroom techniques?" is another question, namely, "What are current teacher practices and in what ways should these be changed?" These questions seem appropriate to systematic research and were posed as the available literature was reviewed.

Vocational Education R and D has been funded since 1965. During this period, according to Miller and Miller (1974, p i) approximately $250 million have been spent. In a supplemental report for Project Baseline on the impact of research on vocational education, Miller has this to say, "Projects have been reporting impact by reporting the resulting 'output' from the project in terms of students contacted, curricula generated, etc., and not by any deliberate purposeful intent to report the actual changes caused in people." The results from the search for this report, with some exceptions to be reported later, supported Millers' conclusion. With the limited direct systematic evidence concerning the effectiveness of R and D efforts to influence teacher practices, one is left to draw inferences. From Miller and Miller's analysis of monies expended under Parts C and I, development of curriculum was given high priority. Although not exclusively for curriculum development, approximately 50 per cent of the Commissioner's discretionary monies under Part C, since 1971, has been spent on Career Education. Under Part I, 82.7 per cent of the money granted has been spent for curriculum development; 6.8 per cent for the National Curriculum Coordination Network; 2.6 per cent for personnel training, and 2.2 per cent for dissemination. The authors report that no significant amount has been spent on establishment of a basis for curriculum

development efforts throughout the nation (p. 52). The absence of such expenditure may be grounded in that research has been completed relevant to curriculum development. Phipps and Evans (1968, p. 377) report that citations included in their review does not reflect adequately the "vast amount of research conducted" relating to curriculum development.

The R and D effort to influence teacher practice seems to have been directed to alter existing practices by developing new instructional materials. Instructional materials have been developed for use with elementary, secondary, and post-secondary students, such as the school based Career Education Units, Worthington (1974), Hull (1974), Consumer Education materials (Murphy); Women in the World of Work (Vetter); Industrial Arts Curriculum and Distributive Education (Crawford, 1967). Koenig (1973) reports the development of curriculum guides in all areas of vocational education. In addition, attention has been directed to needs for new teacher education curricula. Cotrell (1971, p. 333-339) describes the research and development efforts of The Center for Vocational and Technical Education at The Ohio State University in the project "Model Curricula for Vocational and Technical Teacher Education." Pedagogical aspects of teaching were studied to identify the performance requirements

of teachers in each of the vocational service areas. Over 300 performance elements were identified. Several specific behavioral objectives were developed for each element. Cotrell continues that by developing professional education with such specific objectives performance-based curricula may be prepared. A cooperative education teacher preparation program is envisioned in which modules of pedagogy are developed for individualized self-instruction in conjunction with apprentice-type experience with a teacher. Chase (1972) describes efforts to validate these modules.

Such a program of teacher education could be used for both pre-service and in-service instruction.

DISSEMINATION AND DEMONSTRATION

What evidence exists that teachers use instructional materials from R and D efforts? Miller and Miller (1974, p. 49) report that eighty thousand copies of curriculum materials reach the field in seven vocational areas. Ginn (1972) in a study of the utilization and dissemination of materials produced by the Research and Curriculum Coordinating Units in Mississippi found that a high percentage of directors and teachers of vocational education were not aware of the CCU, the services provided or the procedures to request services. Magisos (1971) surveyed teachers, administrators,

local directors, supervisors, teacher educators, and researchers in six states (New York, New Jersey, California, Oklahoma, Wisconsin, and Nevada) to determine the sources of information used. Of the 1072 teachers responding, 70 per cent reported using the local or area school library, 50 per cent their professional organization, 42 per cent the university or college library, 10 per cent the state vocational-technical education research coordinating unit, and 3 per cent the ERIC Clearinghouse. Teachers rated the local or area library as slightly less adequate than the ERIC Document Reproduction Service, university or college library, or ERIC Clearinghouse. Teachers had the lowest proportion, about 22 per cent, indicating familiarity with ERIC. Of administrators, 57 per cent reported familiarity with ERIC as did 65 per cent of local directors, 59 per cent of the supervisors, and 53 per cent of the teacher educators.

Proportions reporting that they had systematic instruction in use of ERIC ranged from 10 per cent for teachers to 22 per cent for administrators and teacher educators to 24 per cent of local directors and supervisors. Of the teacher respondents, almost 66 per cent reported having used none of the ERIC materials; 6 per cent reported having used AIM, and 7 per cent reported having used ARM and RIE. Proportions ranged between 30 and 40 per cent of administrators, local directors, supervisors and teacher

educators indicating that they had used none of the ERIC materials. Between 10 and 40 per cent reported having used ARM, RIE, AIM, Review and Synthesis of Research, ERIC Microfiche. Over eighty per cent of all categories of respondents indicated willingness to participate in an intensive one-day training session on the use of ERIC. These findings raise some serious questions concerning whether teachers avail themselves to products of the R and D effort accessible through ERIC. The larger proportions of administrators, local directors, supervisors, and teacher educators reporting use of ERIC lends credence to the view that these groups are strategic channels for dissemination of research and development products. This is supported further by the fact that almost 2/3 of the teacher respondents indicated they had been enrolled in courses in the past 12 months. One of the purposes of Magisos' study was to gain information germane to improving dissemination. He recommends development of local resource units, since the greatest use is made of these and ready availability of materials ranks very high as a factor determining its consideration in decision-making. House (1974, p. 67-69) maintains that administrators normally hear about an innovation through some market mechanism outside of the teachers' information field and that administrators carefully control all information relating to it. Brickell

(1974) notes that dissemination is probably over-used as a diffusion tactic because it is relatively inexpensive and does not demand extraordinary talent. To move a prospective adopter of a new teacher practice from awareness to actual adoption requires more expensive communication techniques such as personal contact and training. Thus evidence of availability is a weak indicator indeed of influencing teachers to change practices.

Demonstration is another approach to promoting change either from present practices or adding new practices to existing practices. Havelock (1973, p. 169) notes that to be effective a demonstration must look convincing, show clearly and dramatically that the innovation makes a difference for the better, and is something that the client can use in his own setting with his own resources. Impressionistically, it seems there is much skepticism regarding the effectiveness of demonstration as a means of getting teachers to change practices. House, Kerins, and Steele (1970) studied the impact of demonstration centers in Illinois. The results showed that about 29 per cent of the 1100 teachers and administrators in the sample were able to supply a concrete example of behavior change. The researchers note that this example may be of a one-time trial. Considering 100 per cent success an unrealistic expectation, they

conclude that the centers must be judged a success in getting 29 per cent of the school personnel to try out things. This is qualified by the fact that persons visiting the centers were strongly self-selected, wanting to change before they came and thus are not representative of the total educator population. In seeking information about the depth and duration of change, teachers were interviewed in 34 target reimbursement districts (a 10 per cent random sample) regarding who and what had influenced their program. No specific reference was made to demonstration centers. Teachers in 10 per cent of the districts attributed substantial influence to help from demonstration center personnel though not to visits to demonstration centers. Only about 2 per cent of the target reimbursement districts had adopted a demonstration program in total. This had been the original goal of the centers. They note that little evidence was found of earlier demonstration programs such as "new math," even in districts that had been field test sites. They concluded that what resulted was a patchwork of partial adoptions which extended neither to all grades, subjects, or schools in a district nor to all classes within a grade, subject area or school. "Changes directly attributable to demonstration centers tended to be not very far-reaching" (p. 28).

Orlosky and Smith (1971, p. 36) in a study of educational changes over a 75 year period note that 83 per cent of the failures were attempts

to change instruction or curriculum and they were promoted in specific schools or in a limited number of schools. It appears, to these researchers, that other schools do not copy a prototype.

Although, the programs and curriculums included in the above studies were not vocational education, the processes are applicable to vocational education.

TEACHER EDUCATION: CHANNEL OF DISSEMINATION, DEMONSTRATION AND TRAINING

All teacher education is basically directed toward changing behavior of individuals. Pre-service teacher education is directed to teaching novices, competencies considered necessary for effective teaching. This includes modifying those behaviors from natural predispositions and previous learning which may be in conflict with or decreases effectiveness as a teacher. In-service education is directed to continuing improvement through up-dating teachers, facilitating the acquisition of information and pedagogical skills more recently obtained or developed. The organization and structure of pre-service and in-service education includes various components, such as formal classroom instruction, field experiences (school visitations, internships,externships), institutes, workshops, and so on. It seems that much of teacher education has been based on the

premise that cognitive achievement is the way to produce effective teaching behavior. During the 1950's and 1960's, research efforts to delineate effective teaching behavior netted relatively little return. Recent efforts are turning to student learning outcomes as a criterion variable for assessing effectiveness of teaching behaviors.

Several reviews of related research, and research on vocational-technical teacher education and teacher education, in general, were useful in seeking to answer the following question. What has been the impact of research and development on teacher education as a vehicle for influencing teachers to change practices? Reviews studied included Moss (1967), O'Brien and Schaefer (1966), Phipps and Evans (1968), Householder (1968), Ward (1972), Schaefer and Law (1973), Peck and Tucker (1973), and Peterson (1973). Inclusions in the AVA Yearbooks (1971, 1972, 1973, 1974) also proved informative. Studies identified in the computer searches were reviewed as well. Since the utility of treating pre-service teacher education and in-service teacher education as separate factors which influence teachers to change practices appears dubious in light of the research evidence, these will be considered as one.

Peck and Tucker (1973) report that the available experimental research on the process of teacher education appears to demonstrate the following:

> 1. A "systems" approach to teacher education, often called "instructional design" substantially improves its effectiveness. There are a number of studies illustrating that this works equally well to induce desirable teaching behavior in cognitive and in affective respects. A good deal of research is clustered around three special cases of this general model: training teachers in interaction analysis, microteaching, and behavior modification. p. 943

Peck and Tucker elaborate that the systems approach consists of a series of steps which recur in cyclical fashion. These steps are: precise specification of the behavior which is the objective of the learning experience; carefully planned training procedures aimed explicitly at those objectives; measurement of the results of the training in terms of the behavioral objectives; feedback to the learner and the instructor of the observed results; reentry into the training procedure, e.g. a trial-teaching experience; measurement again of the results, following the repeated training.

> 2. "Teacher educators should practice what they preach. When teachers are treated in the same way they are supposed to treat their pupils, they are more likely to adopt the desired style of teaching behavior.
>
> 3. Direct involvement in the role to be learned, or such close approximations as sensitivity-training laboratories or classroom simulation laboratories,

produce the desired teaching behavior more effectively than remote or abstract experiences such as lectures on instructional theory.

4. Using any or all of the techniques just mentioned, it is possible to induce a more self-initiated, self-directed, effective pattern of learning, not only in teachers but through them, in their pupils.

5. Traditional ways of educating teachers have some of the intended effects, but they also have some quite undesired effects.

6. The training of teachers is a current concern at numerous places in the U. S. At this point in time there is no empirical research whatever on this aspect of teacher education.

7. One long needed methological advance is beginning to appear in research: the use of pupil-gain measures as the ultimate criteria of the effectiveness of any given process of teacher education. These include affective and behavioral gains as well as gains in subject mastery." (p. 943)

The studies reviewed and synthesized by Peck and Tucker were completed in teacher education programs for a variety of subject areas. Several studies have been of vocational teachers (Tuckman and Oliver, 1968; Cotrell and Doty, 1971; Hoerner, Doty, Cotrell, 1971; Harrington and Doty, 1971; Doty and Cotrell, 1971; Chase, Doty, and Cotrell, 1971. Doty (1971) in reviewing research of micro-teaching with vocational teachers concludes that micro-teaching with or without video feedback

is an effective method of changing teacher behavior. Peterson (1973) concludes in a review of research on vocational education teacher preparation, pre-service and in-service, -- "that studies relating to in-service teacher education seem to imply that improvement of instruction can occur with the use of feedback techniques and teacher self appraisal.

If behavior is to be changed, there must be direction for the change. What competencies should teachers have and by what criteria? The temper of our times is to want instant answers and instant solutions to all events perceived as problematical, simple or complex. The R and D effort at the Ohio Center for Vocational and Technical Education has endeavored to identify teacher competencies needed by vocational teachers. In the mid-sixties, invitational conferences were held to consider the research in teacher education, in the areas of trade and industrial and technical education (Cotrell, 1966; Reese, 1968, Miller, 1967). One of the recommendations from these conferences was to identify teacher competencies. The identification of competencies was undertaken through a process of occupational analysis methodology. Task forces (teacher educators, state supervisors and master teachers), vocational and critical incident studies were used to identify and verify

the competencies. Performance elements (384) were grouped into 50 performance oriented cluster titles through factor analysis and logical synthesis. Reporting in 1972, Andreyka and Del, indicate that the teacher education project has now moved to the production of modules to provide pre and in-service teachers with performance-based teacher education. Rutgers University and other colleges in New Jersey have been participating during 1974-75 in the field-testing of some of these modules. It is clearly evident that a programatic effort is underway to impact on teacher education as a vehicle for influencing teacher practices. It is too early in the phase of development to expect influences on teacher practices, per se, or to find research results detailing the type of impact under varying conditions. Available evidence suggests the value of this approach. Peterson (1973) reports that an evaluation of competency based teacher education programs in use in Nebraska and Minnesota showed improved beginning teacher performance and highly improved student teacher satisfactions. (p. 29) Handley and Shill (1973) in two studies, one of per-service teacher education and a second of in-service education have used the competencies identified by Cotrell et al to develop a questionnaire to survey teachers (3 or less years experience for pre-service and more than 3 years experience for in-service). The objective was to get assessments,

(self-reports of teachers, teacher supervisors, and teacher educators) of the level of adequacy, specific competencies had been developed through pre-service and in-service education. On the bases of data from 405 teachers assessing pre-service and over 700 assessing in-service, recommendations were made.

Workshops, conferences, and institutes have been frequently used as a means of disseminating information to both pre-service and in-service teachers. The literature contains numerous references of conference and workshop reports. Evaluation of the endeavor is often included, however, in most cases it is a report of participant satisfaction or intention to use conference content during or immediately following the conference. Relatively few studies endeavor to assess the extent to which these types of experiences influence teachers to change behavior. Ward (1972) cites a study investigating the third phase of Project In-Step, which was to develop a viable model for individualized, multi-media in-service training. The project involved the field testing of an individualized model, through a course in Management of Instructional Systems. Of the 85 teachers participating, 95 per cent developed a management system based on the training and completed at least one of the modules with a mastery of its contents; 98 per cent indicated a change in their

classroom behavior. Other studies cited have investigated use of films, video-tapes, micro-teaching and television. Pratzner and Hanson (1969) tested the relative effectiveness of an integrated lecture-discussion course presented by a qualified vocational-industrial teacher educator with a packaged course consisting of 16 MM sound film presentations followed by group discussion with related guides and materials. Subjects in the film-discussion sections showed statistically superior performance on the criterion tests over the lecture discussion group. The differences, however, were not viewed as being educationally significant.

Allen (1968) used a follow-up questionnaire with 13 trade and technical teachers to find out the degree to which they had adopted 15 instructional innovations that had been presented in a summer workshop 8 months earlier. The innovations were: color keyed instruction sheets, methods of illustrating difficulty of learning and communication barriers, controlled notes, instant evaluation, time line presentation of history, getting immediate feedback from class; spiral concepts, group dynamics, achieving level of objectives, film slides and window shades, jigsawed illustrations, four methods of grading and item analysis. Results showed that participants planned to use 30.8 per cent of the innovations and were using 58.5 per cent. Innovations used by 10 or more teachers were color

keyed instruction sheets, controlled notes, instant evaluation, immediate feedback, and film slides and window shades. Tuttle (1969) concluded that competent data processing and computer programming instructors, including teachers from other disciplines can be trained in two summer institutes and their success can be predicted from aptitude tests. Stevenson (1970) reported on a two week institute to orient participants to the world of the disadvantaged and to give them ideas on methods of training teachers for disadvantaged adults. In addition to lectures and discussions, a live-in arrangement had participants spend four nights in the home of a disadvantaged family. A 4-month followings found that most participants subsequently engaged in one or more activities designed to improve education for the disadvantaged.

Williams and Hull (1968) report on the results of two summer institutes to train vocational agriculture teachers for conducting cooperative agricultural occupations training programs in secondary schools. Although evidence available, according to the researchers, indicated teachers mastered the competencies needed to implement the innovation program outcomes appeared to vary greatly. Of the 32 teachers participating, 8 adopted the innovation, i.e. 25 per cent. An examination of selected variables indicated that the number of teachers in the vocational agricultural

department accounted for the largest proportion of variance (36 per cent) among teachers. Other findings pointed up the relevance of situational factors for the acceptance of the innovation. Kievit (1971) reported on the results of teacher-led workshops planned to prepare home economics teachers for developing wage-earning emphases in home economics. The research was an experimental-control design. The basic question to be answered was the extent to which the workshops stimulated adoption of various forms of wage-earning emphases over that which could have been expected to occur without the workshops. Eighteen month follow-up data were obtained from 82 per cent of the 158 teachers comprising the experimental (79) and control (79) groups. The frequency of change reported by the experimental group exceeded that reported by the control group from 7 to 17 per cent depending on the base of comparison. It was evident that workshops introduced the innovation to approximately 1/5 of the experimental group. Findings showed that the rate of adopting this curriculum innovation was slow at between 1 1/2 to 5 per cent increase within a 1 1/2 year period. Teacher-led workshops as implemented in this study led to approximately doubling the rate of adoption. As Ward (1972) noted, experimental-control designs have been used quite infrequently in evaluating outcomes from the diverse types of in-service efforts. The

abstract bibliography of teacher education programs, prepared by Mathieson (1972) provides considerable evidence to this effect. Results reported from the various in-service activities tend to be on immediate effects and are self-report measures of teachers on impact. These are weak measures, at best, of influence on teacher behavior. Evidence indicates that the dissemination of information regarding subject matter taught, pedagogical practices e.g. color coded instruction sheets, 16 mm single concept loops, modes of questioning students may require different communication channels to influence teachers to change existing practices. Yet specific relationships between the "product" being disseminated, the target audience, the objective of the dissemination effort, and the channel and nature of the communication can only be inferred and still contains a large element of the "educated guess."

The research tasks identified by Moss (1967, p. 21) in his review of research on teacher education remain to be accomplished although some progress can be discerned during this eight year period. In view of this, these bear repeating. The need is to (a) extract the specific effects of various kinds of competencies upon teacher behavior patterns under differing stimulus conditions; (b) to measure the extent to which identified influential competencies can be altered by deliberate educational treatments, and thus determine the degree to which they must be prerequisite to program

entry or can be formed during the program and (c) to validate our assumptions of appropriate teacher behavior patterns under various educational circumstances in terms of actual student outcomes.

Moss notes that at present we are still operating programs primarily on the basis of tradition, "convention" wisdom and personal experience. He continues that "this does not imply that current teacher education practices are necessarily bad only that we really don't know their worth and that we cannot be reasonably confident about judging suggested means for improving present practices." An understandable caution in making changes based on current knowledge is reflected in one study (Allan, 1966) which asked fifty trade and technical "leaders" from thirty-eight states to indicate the extent of innovations in their teacher education programs since 1961; "slight to moderate" change was the mode. The fact that the same study showed widely differing program requirements indicates the importance of tradition and personal experience in determining program." (p. 26)

In sum, the extent to which R and D has had an impact on teacher behavior through pre-service and in-service teacher education is still largely speculative. From Magisos' (1971) study a far larger proportion (hovering around 50 per cent) of teacher educators appear to be linked

into the sources of information about R and D than the proportion of teachers. The extent to which this link nets knowledge and transmission of the knowledge to teachers remains largely unanswered by systematic research, as does the question regarding the relationship between transmission of knowledge to teachers and changes in teacher practices. Adamsky (1973) in a study to ascertain the extent to which T and I teachers enrolled in a teacher certification program emphasizing the use of behavioral objectives had adopted the use of behavioral objectives found that 264 (2/3 of 394) reported using behavioral objectives in instruction. On site visits to check reliability and validity of the self report measure from a sample of 85 found that only 27 (39 per cent) out of 70 teachers reporting adoption had any written behavioral objectives for their courses to show the investigator. This only reinforces the skepticism regarding the discrepancies between reporting and implementation. Deal et al (1974) reported a reduction of from 73 to 30 per cent of schools in the sample having team teaching when probed with depth questions. Swanson (1974) in a Project Baseline supplemental report on the preparation of teachers for vocational education, indicates that in-service programs have grown rapidly. He continues that there is no measure as to whether these are remedial or professional development programs, or the extent to which the system of incentives and rewards for in-service education is linked

to the qualitative improvement of Vocational Education. (p. 22) There is increased evidence regarding the effectiveness of the systems approach, modeling, and involvement in situations for learning that are either actual or simulated work situations as processes for altering teacher behavior. The R and D effort in vocational education has been linked in with total educational R and D, utilizing, contributing to, and extending the outcomes from the broader effort. A continuation of this practice would seem to net the greatest return for vocational education.

CHARACTERISTICS OF R AND D PRODUCTS: AS MODERATING VARIABLES

The literature on diffusion of innovations quite consistently includes attention to the attributes of the innovation as significant to the pattern and rate of diffusion (Rogers, and Shoemaker, 1971; Havelock, 1969; Brickell, 1974; Hull, 1971; Orlosky and Smith, 1971). Various generic attributes have been identified, however those most frequently used include: relative advantage, i.e. the gain to be expected from changing; complexity, e.g. color keyed instruction sheets or use of non-directive versus directive teaching methods; divisibility, i.e. can it be tried on a small scale prior to complete adoption; communicability,

clear, finite versus vague, and relatively abstract; compatibility, i.e. consistent with or neutral when examined in terms of norms and values of adopters. Educational innovations have also been described substantively as instructional, curricular, and administrative.

The various reviews of research on teaching and teacher education quite consistently agree that few educational innovations have been empirically demonstrated to produce significantly different outcomes in student achievement. Pincus (1974) states" it is nearly impossible, given the present state of educational information systems, to document whether a new curriculum, new physical plan, or an audiovisual system helps or hurts children's learning or attitudes." Householder (1968) in reviewing research on techniques and modes of instruction reports results of studies on instructional media, television, programed instruction, tape recordings, multimedia modes, textbooks, arrangement of content, organization of learning experiences, concomitant learnings, creativity and skill development. He concludes "that substantial research activity has not yet made significant contributions toward the establishment of a body of knowledge on techniques and modes of instruction . . . . Well designed studies evaluating specificable variables under controlled circumstances and utilizating valid and reliable criterion measures are

most likely to yield generalizable results." (p. 390). Five years later, Peterson (1973) concludes that "the examination of the research in the area of teaching methods tends to show no significant differences or significant differences dependent largely upon the variables." (p. 30) He recommends that teaching methods should be researched more fully. The review of research on teaching by Schaefer and Law (1973) tends to corroborate this conclusion. Thus on at least one significant aspect of relative advantage (increased student learning) the case for changing from the existing practices of many teachers is not particularly strong. Brickell (1974) maintains that changes being promoted do not necessarily have to result in gains in student learning, but assuredly must not reduce learning. At the present, the case for promoting acceptance of R and D products may have to be on the basis of being more compatible with a generally accepted educational philosophy.

The evaluations of curricula reported by Phipps and Evans (1968) seem not to have used experimental-control designs, but rather to have examined a type of internal consistency assessment between the objectives of the curriculum being appraised, the effectiveness of the materials included and use made of these. Others examined the extent to which achievement in subsequent related programs were influenced by achievement

in earlier grades. This focus was on the adequacy of articulation. Research efforts to compare the differential outcomes from several curricula organized and sequenced differently were not reported for vocational education, such as Walker and Schaffarzick (1974) report for other areas. Yet this is the type of research which would provide evidence of the greater or lesser effectiveness of existing alternatives.

As indicated in a number of reviews (Moss, 1967; O'Brien and Schaefer, 1966; Ward, 1972; Peterson, 1973; Phipps and Evans, 1968; Householder, 1968) much of the research was completed as doctoral studies. Such studies are frequently completed with limited resources and rarely produce findings with broad generalizability. With adequate funding programmatic efforts of vocational education R and D should be able to make some significant contributions. The beginnings are there in the industrial arts curriculum, the school based career education model, and the teacher education competency research and instructional modules.

WORK CONTEXT: A MODERATING VARIABLE

Rogers and Jain (1968) in discussing needed research on educational diffusion note that research has been directed to the source of innovations rather than receivers and on the individual as the unit of analysis rather than the organization. They point out that teachers do work in organizational settings which have an important influence on teachers' innovative behavior. Pincus (1974, p. 117) analyzes the incentives for innovation in the public schools and notes that "the responses of schools to opportunities for innovation appear therefore to be complex and between the adoption and the implementation, innovations routinely disappear or suffer sea-changes." His analysis contrasts the school with other types of organizations and results in some provocative recommendations relative to educational R and D efforts to impact on schools. Crawford et al (1972) analyzing twenty-one R and D products, including the cluster concept in vocational education, have tried to test hypotheses regarding the attributes of innovations, and diffusion strategies employed. Crawford et al also make some recommendations for the R and D establishment. Within Pincus' excellent review and synthesis of research, the influence on teachers' practices is still more implicit than explicit.

House (1974) has explicitly analyzed the teachers' predicament within the school relative to implementing innovations. Although the research utilized is not of vocational teachers, the similarity in the structures of vocational, academic or comprehensive schools is sufficient for some applicability. Teacher incentives to change practices are relatively limited in view of the few opportunities for professional advancement. The rewards are released time, better classes, more classroom improvements. While rewards are limited, costs are high with often only limited evidence that the innovations are worth the investment. The amount of energy and time required to learn the new skills or roles associated with the innovation is an index to the magnitude of resistance. The relative isolation of the teacher in the classroom reinforces the antonomy-equality norm which is highly valued by teachers. (Deal, Meyer, Scott, 1975). The antonomy-equality norm may impede success in efforts to establish lateral communication among peers for the purpose of developing supportive group reinforcement for a particular innovation. Cohen (1973) found that teachers have professional and vertical ambitions. The professional ambition is satisfied in a setting with more frequent opportunities to see each other teach, and where teachers work as teams. House asserts that one way to break through the low reward structure is

to develop "entrepreneurial" activity. Entrepreneurial groups can provide informal rewards to each other and as a group bargain more effectively for formal rewards within the school. The case study by Pellegrin (in Charters, et al, 1973) of differentiated staffing raises some questions regarding the specific circumstances under which the establishing of entrepreneurial groups would be effective. House, Pellegrin and others provide evidence that there is a strong tendency for group values to turn reorientations into variations and variations into regular practice. House maintains that this is not to demonstrate that teachers are perverted or incompetent, but that forces impinging on the teacher in the classroom are such that without strong support and reinforcing mechanisms behavior will revert to previous patterns. The work of Seymour Sarason (1971) reaches a similar conclusion.

Baldridge (1972) cites logical weakness identified by Katz and Kahn in seeking to approach institutional change in individual terms. Assumptions made in this approach include: " 1) the individual can be provided with new insight and knowledge; 2) that these will produce some significant alteration in his motivational pattern; 3) that these insights and motivation will be retained even when the individual leaves the protected situations in which these are learned and returns to his accustomed role in the organization; 4) that he will be able to adopt his new knowledge to

that real-life situation; 5) that he will be able to persuade his co-workers to accept the changes in his behavior which he now desires and that he will also be able to persuade them to make complementary changes in their own expectations and behavior." (p. 6, 7). Etzioni (1972) considering a broad array of efforts to solve social problems by changing people documents the fallaciousness of the assumptions detailed above. He suggests that trying to solve social problems by changing people is apparently less productive than accepting people as they are and changing their circumstances instead. Baldridge suggests a "political systems" approach which focuses on the authority structure, communication channels and evaluation patterns. Each of these subsystems within the organization have implications for deciding on which innovations, adequacy of communicating the objectives of the innovation decision, the nature of the innovation, and assessment and monitoring of implementation.

Research on organizational supports for innovation has usually investigated a limited number of variables. (Carlson, 1968). Research findings do not provide conclusive evidence regarding relationships. Research is in process at the Stanford Center for Research and Development in Teaching to study relationships between organizational characteristics of school districts and schools to the support and maintenance of

innovations. Deal et al (1975) reporting some preliminary results of a longitudinal study point up the complexity of interrelationships between a number of variables. They report that significant district-level predicators of differentiated reading instruction are per pupil expenditure, external funding, special administration ratio and district size. The first three effect instructional differentiation positively, the fourth negatively. At the school level, open space had the strongest independent effect on reading differentiation. Principal leadership and evaluation structure related to differentiation significantly also. The pattern of relationships to team teaching was different.

Several studies in vocational education change efforts have examined the possible influence of organizational variables on teachers adopting innovations. Kievit (1971) in an experimental-control study designed to test the effectiveness of teacher-led workshops to get home economics teachers to initiate wage earning emphases in programs found that eight variables accounted for 25 per cent of the variance between adopters and non-adopters. Teacher perceptions of the supportiveness of the school to change was the second variable to enter the multiple regression analysis. Williams and Hull (1968) concluded that vocational agriculture teachers in multiple-teacher departments were more successful

in the implementation of a cooperative agricultural occupations curriculum than schools with single-teacher departments. Size as indicated by student enrollments was also positively related.

Work context as a moderating variable to influences to change teacher practices has not been the subject of much research in education generally nor in vocational education research. It is rather generally agreed that the measures of the dependent variable, whether it be teacher reported changes in practice or organizational innovation, which implies changes in teacher practices, are inadequate for the most part. Yet it is rather generally accepted that much is lost between an organizational or teacher adoption decision and implementation and routinization. Expert opinion and the available research suggests that the work context is a vital link in successfully implementing planned changes in instruction. Deal et al (1975, p. 126) state: "One explanation for the high turnover of innovations is that necessary structural conditions either do not exist or they have been discouraged partially by emphasis on change for the sake of change. There appears to be a lack of authority to manage or coordinate complex instructional or organizational innovations at a higher level. This no doubt reflects another feature of the climate of innovation in which coordination or control carry negative connotations. But we argue that

some organizational coordination and control may be necessary to support more complex and sophisticated modifications in instruction or the organization of work at the classroom level encouraged by the climate of innovation. . . . organizational change comes hard and . . . to survive, alterations in either the instructional or organizational status quo must have appropriate support from various levels in the organization. It is this kind of knowledge about how to organize districts and schools for effective instruction that educators are seeking." Some of the R and D efforts to impact on teacher practices are trying to utilize what is known to develop the support structure. These efforts are undertaken with the usual financial and time constraints. The one vocational education R and D product included in Crawford et al (1972) was the cluster approach developed in a university. Plans for diffusion were developed only after some validation of the product. When funds for diffusion were sought none were obtained. The work of Charters et al (1973) point up some of the basic issues concerning the interface between R and D agencies and local school districts engaged in a collaborative effort to move from the decision to adopt an innovation, such as differentiated staffing or career education (Hull, 1974), and implementation. No easy solutions are evident on the horizon and programmatic R and D seems called for.

DEMOGRAPHIC, PROFESSIONAL, AND PERSONALITY ATTRIBUTES OF TEACHERS AS A MODERATING VARIABLES

Rogers and Shoemaker (1971) report that research results tend to support the generalizations that innovators and early adopters tend to be more venturesome, more cosmopolite, less dogmatic, more favorably inclined toward education, more educated, of higher social status and upwardly mobile, have higher levels of achievement motivation and higher aspirations than later adopters. Efforts within vocational education to identify target populations most likely to be receptive to change have included some of these demographic and personality variables. Russell, (1972) developed a measure of the change orientation of vocational teachers. He employed the method of known groups and produced a measure on which early adopters differed significantly from laggards. His findings also showed early adopters, as a group, had scores significantly different from laggards in the direction of being less dogmatic. Similarly early adopters were more cosmopolitan and less conservative than laggards. Kievit (1971) found that home economics teachers most likely to adopt wage earning emphases in home economics were mature professionals between 40 and 50 years old; had stability in their teaching positions, valued work as an end in itself, perceived themselves as highly effective

teachers, report comparatively higher satisfaction with supervision and adult relations on the job, report participation in professional organizations, and had more highly positive attitudes towards vocational education. Differences on measures of risk-taking propensities and dogmatism were not statistically significant. Demographic and personality variables are often less amenable to modification. Since the limited evidence available points to low though positive relationships to change, a more productive line of inquiry and action seems to be to concentrate on situational variables that can be altered to facilitate change such as those considered under work context.

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